

DRINKING  
WATER

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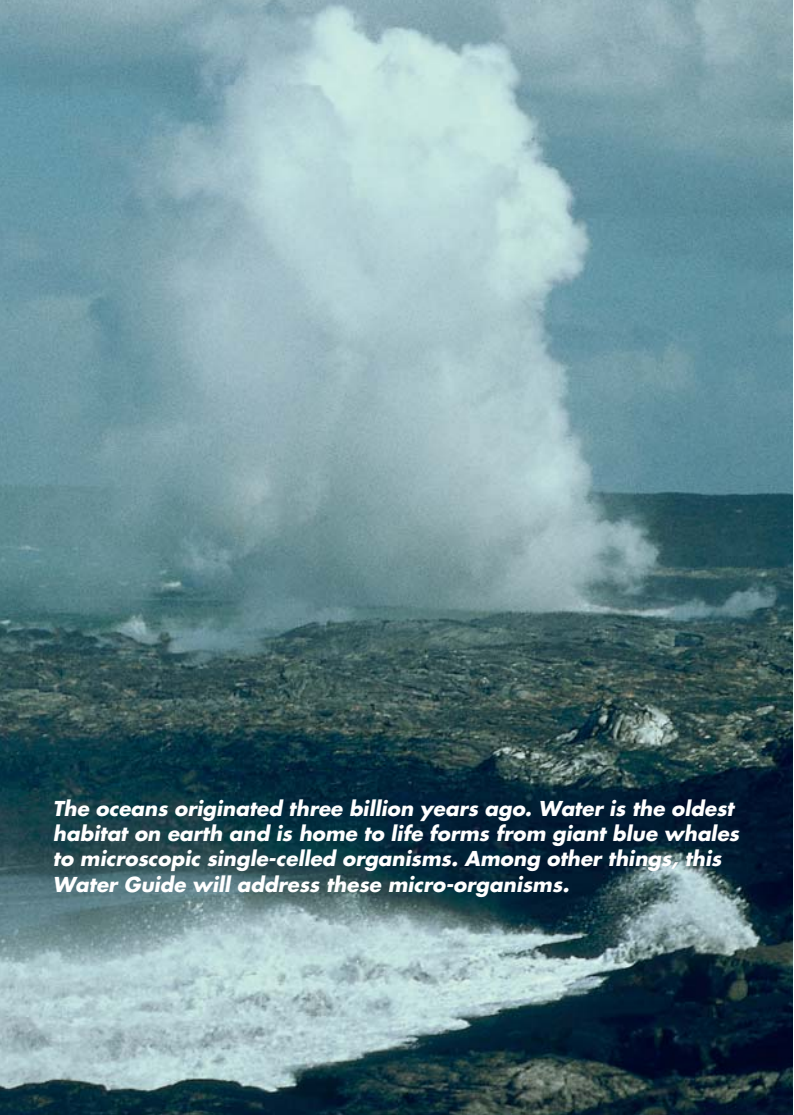
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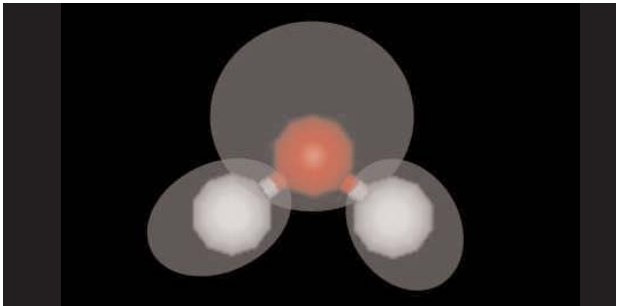
MAKING WATER DRINKING WATER

**WATER GUIDE** FOR SAFE DRINKING WATER



***The oceans originated three billion years ago. Water is the oldest habitat on earth and is home to life forms from giant blue whales to microscopic single-celled organisms. Among other things, this Water Guide will address these micro-organisms.***

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*Water is a tiny V-shaped molecule with the molecular formula H<sub>2</sub>O. The water molecule consists of two light hydrogen atoms (H) and a relatively heavy oxygen atom (O).*

## DRINK SAFE WATER WHEN TRAVELLING

### **THE MOST DANGEROUS ANIMALS ARE SWIMMING IN DRINKING WATER**

Europeans are the world champions when it comes to travel. Getting to know new cultures and visiting natural wonders has a very special appeal. But some trips also involve health risks when, for example, the hygienic standards in foreign countries differ from those at home. Travellers then become personally responsible for their health, especially as far as food and drinking water supplies are concerned.

If the people in charge of public water supplies in a foreign country do not rigorously check and assure the quality of their drinking water, travellers must find a reliable, portable water treatment solution.

The goal of this Water Guide is to provide information on the drinking water problem during trips and to offer appropriate solutions. It is designed to create an awareness of drinking water as a resource that is becoming increasingly scarce worldwide. The information and tips it gives focus on feasibility. However, there is no miracle cure. For example, it is not possible to remove heavy toxic and microbiological contamination from water at a single stroke. But it is possible to reduce the risk of contaminated water jeopardising your health – through proper knowledge, reasonable precautions and, not least, common sense.

Stay healthy on your trips!

Burkhard Rieke M.D.

Internist and specialist in tropical medicine, Düsseldorf, Germany



## WATER ABOUNDS, BUT DRINKING WATER IS SCARCE

### **BLUE GOLD**

97% OF THE WORLD'S WATER SUPPLIES ARE SALTY. TWO THIRDS OF THE BALANCE ARE LOCKED UP IN THE POLAR ICE CAPS. A MERE 1% IS FRESH-WATER, WHICH DOES NOT MEAN IT IS FIT FOR DRINKING.

The total freshwater supplies on earth are on a steady decline. Yet there must be enough to go round for an increasing number of humans. A little over half of the world's population has 36% of all existing water resources available.

According to a UNESCO study, two million tons of waste water are dumped into the world's rivers and lakes day in, day out. Severe overuse and clearance of ecologically important forests, intensive agriculture, countless infrastructures and the unceasing rise in tourism are having an enormous impact on the natural water balance and existing water resources. More than half of the world's major rivers are polluted or are running dry. Things are not better for many lakes and wetlands.

Each day, 5,500 million cubic metres of water are consumed throughout the world. Sure, this volume is available. In fact, a ten-fold excess of water is available. The problem is the geographical and seasonal distribution. Rain and other precipitation fall irregularly. The Pacific islands, India and Indonesia receive significant precipitation. On the other hand, rain in Sahara is all but inexistent.

In the future, new and complex technologies will contribute to the production of drinking water. Examples include seawater desalination and water extraction from the northern and southern polar ice caps.

But then, we want to travel. Today, already one in five holiday travellers visits tropical or subtropical areas. Often, they are not or only insufficiently aware of the water situation in the countries they are going to. Although many holiday-makers know the old colonial-era rule of "boil it, cook it, peel it or forget it," they trust local water supplies as though at home. Water supplies may vary even within large conurbations, depending on whether a holiday resort is connected to the local water network.

### UNESCO STUDY

In a recent study published by UNESCO on global water quality, Great Britain ranked 4th, the USA 12th and Australia 20th. The leaders were Finland, Canada and New Zealand. Belgium finished last, behind India, Jordan and nine African countries.

### WHO STUDY

According to the World Health Organisation WHO, contaminated water accounts for 80% of all diseases contracted during travel. This affects one in every two travellers to distant regions. Occasionally, diarrhoea may disrupt travel plans completely. No vaccine has as yet been discovered to prevent it. People afflicted with diarrhoea during trips typically overcome the disorder within 48 hours. But time and again, cases will require medical treatment upon returning home.



*Good drinking water is clear, colourless, odourless and has a pleasant taste. According to international hygienic standards, it must be free of pathogens indicating the presence of human or animal excrements. The total germ count must not exceed 100 per 100 millilitres. Drinking water is not pure water. It should contain minerals and salts vital to our organisms.*



## VARIOUS MICROCOSMS IN THE WATER

### **MICRO-ORGANISMS**

IN MANY POPULAR TRAVEL DESTINATIONS, MOST PEOPLE HAVE NO ACCESS TO PUBLIC WATER SUPPLIES. WATER FROM WELLS AND SPRINGS IS HARDLY CHECKED FOR MICROBIOLOGICAL ACTIVITY. ESPECIALLY AMONG POORER AND RURAL POPULATIONS, SURFACE WATER OFTEN AT THE SAME TIME SERVES AS DRINKING WATER – WITH ALL THE RELATED CONSEQUENCES FOR HEALTH.

The most common health risk on trips is the infection by pathogens such as bacteria, viruses and protozoans contained in drinking water. The primary source of contamination is human or animal excrements that have entered the water along different paths. Such contaminated water – when used for drinking, washing and cleaning vegetables – may rapidly lead to infections. According to the EU drinking water directive 98/83/EC, even water used for showering, laundry and dish-washing must be of drinking water grade.

## Drinking water contains three groups of pathogenic micro-organisms.

Family	Known germs	Size range
<b>Bacteria</b>	E-coli ( <i>Escherichia coli</i> ), Salmonella ( <i>Salmonella typhimurium</i> ), Cholera ( <i>Vibrio cholerae</i> )	0.2 - 5 microns
<b>Viruses</b>	Hepatitis A, Norwalk Virus, Rotavirus, Poliovirus	~0.02 - 0.2 microns
<b>Protozoans</b>	Amoebiasis ( <i>Entamoeba histolytica</i> ), Giardia lamblia ( <i>Giardia intestinalis</i> ), Cryptosporidium ( <i>Cryptosporidium parvum</i> )	1 - 15 microns

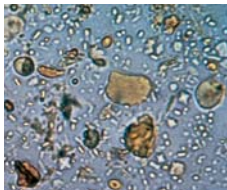
Source: Osmonics, Inc.

A large number of additional pathogens are known besides the germs listed above. But according to WHO, their pathogenic (disease-inducing) action is only slight, or they are primarily absorbed along with food.

### THE THREE PATHOGENIC GERM FAMILIES

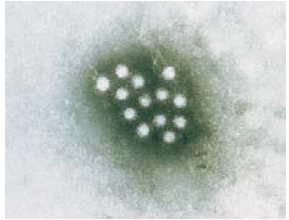
#### Bacteria – the rapid reproducers

Bacteria are single-celled organisms that reproduce rapidly in warm environments – especially water – depending on the available nutrients. Under favourable conditions, bacteria will divide in less than ten minutes. Not all bacteria present health risks; but as soon as they enter drinking water along with animal or human excrements, things will become dangerous. The water must then be sanitised with chemicals, or the germs must be removed by microfilters.



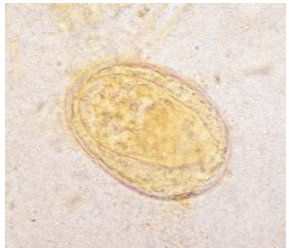
### **Viruses – minute parasites with unpleasant effects.**

Viruses can only reproduce within living cells because they have no metabolism of their own. Their tiny size makes it hard to filter them out the water by mechanical means. For this purpose, filters with pore sizes smaller than 0.02 microns are necessary. But viruses are sensitive to heat and chemical disinfectants. In turbid water, they are typically attached to particles and can therefore be all but completely removed by filters with pore sizes up to 0.2 microns. But to play it safe, it is always advisable to additionally sanitise the filtered water.



### **Protozoans – small but tenacious**

Protozoans are single-celled animal organisms. They are higher-developed than bacteria, which is apparent in their size. Protozoans enter drinking water through animal and human excrements. Until protozoans find a host, they envelope themselves in a membrane (cyst) that is highly resistant to environmental influences. To penetrate these cysts with chemicals, an extended contact time of up to four hours is required. On the other hand, thanks to their size, protozoans can be readily filtered out of the water.



## NATURAL, BUT STILL NOT HEALTHY

**HEAVY METALS**

HEAVY METALS OCCUR NATURALLY IN THE EARTH'S CRUST AND ENTER THE GROUNDWATER THROUGH RAIN WATER THAT IS FILTERED BY THE ROCK LAYERS.

Heavy metals from groundwater may settle in the human organism. For this reason, the World Health Organisation WHO has issued guidelines on the maximum allowable values in drinking water. In public drinking water treatment systems, these values are rigorously monitored. Heavy metals can only be removed from water by costly methods such as distillation or flocculation.

*Far away from any public drinking water supply, women and young girls in Africa spend an average of three hours per day getting water.*



## THE CONSEQUENCES OF AGRICULTURE

### **AGRICULTURAL AGENTS**

AGRICULTURAL AGENTS SUCH AS HERBICIDES, PESTICIDES PLUS MINERAL AND FARM-PRODUCED FERTILISERS MAY ENTER THE GROUNDWATER. IF THE GROUNDWATER IS NOT TREATED, THESE SUBSTANCES WILL ULTIMATELY END UP IN THE DRINKING WATER.

Depending on the nature of the farmland, the agents used in agriculture will be washed out more or less quickly, entering the groundwater or being flushed into surface waters. Traces of DDT have even been detected in mountain lakes high above any agricultural activity. According to one study, the chemical DDT was introduced through evaporated water that fell as rain in the mountains.

But most agrochemicals are organic and can be readily removed by activated carbon absorption.



*To grow, a single orange requires 50 litres of water in the Near East. The UNO has established 20 litres of water per person and day as the minimum requirement. 450 million people in 26 countries across the world do not have access to this minimum.*

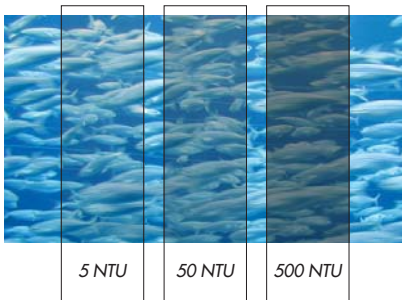
## SUSPENDED SOLIDS AND TURBIDITY

WATER TURBIDITY IS CAUSED BY UNDISSOLVED PARTICLES, SO CALLED SUSPENDED SOLIDS. NORMALLY, THESE ARE HARMLESS SEDIMENTS.

Suspended solids are components in water that provide micro-organisms with nourishment and promote their growth. Though normally harmless, they may prevent effective water sanitising. The disinfectant attaches to these particles and is thereby "spent" or weakened. For this reason, the application of chemical disinfectants is limited to clear water. Turbid water must be filtered before treatment.

### HOW TURBID IS TURBID?

Water turbidity is measured in Nephelometric Turbidity Units (NTU). According to the World Health Organisation WHO, tap water should have less than 1 NTU. The WHO assumes that water with a value of 5 NTU and higher is no longer fit for use as drinking water without filtering.





## METHODS AND POSSIBILITIES

**KNOWING ABOUT CLEAN WATER**

BASICALLY, ANY WATER CAN BE TRANSFORMED INTO CLEAN DRINKING WATER. BUT TRAVELLERS ARE EXPECTED TO KNOW THAT YOU CANNOT SIMPLY SCOOP IT UP FROM A SEWER. DEPENDING ON THE TYPE AND DEGREE OF CONTAMINATION AS WELL AS THE LOCAL CONDITIONS, DIFFERENT TYPES OF WATER TREATMENT ARE AVAILABLE.

**BOILING**

Boiling is one of the oldest and most effective methods for sterilising water. But it requires sufficient time and energy in the form of wood, fuel or electricity. Boiling only eliminates micro-organisms. It will not cause the water to become clear, and chemical substances will remain inside.

The various pathogens in water have different heat sensitivities. Not all of them will be destroyed within the same time. To prevent diarrhoea during trips, certain boiling times must be observed. Because you never know what germs the water contains, it is best to base treatment on the most resistant pathogens. At sea level (0 metres), the boiling point of water is 100°C. Boiling it for five minutes is adequate. At 4000 metres above sea level, the boiling point drops to 86.8°C. At this altitude, water must boil for 20 minutes.

**How to treat diarrhoea**

*It is important for people afflicted with diarrhoea, especially in warm regions, to replace the lost fluids and the electrolytes dissolved in them. This is best achieved using electrolyte and sugar mixtures, which are available in almost all countries. Other effective liquids include bouillon, fruit juices and lightly sweetened teas. An*

*uncomplicated case of travel diarrhoea can be alleviated with diarrhoea-inhibiting medication. A doctor should be consulted when fever or bleeding occur or if the disorder lasts for several days without improving.*

## SANITISING

Disinfectants destroy micro-organisms and thereby prevent the transmission of pathogens. The following substances and processes are allowed in the treatment of water: chlorine gas, chlorine, chlorine dioxide, iodine, ozone, silver and ultraviolet (UV) sanitising. It only makes sense to use these products in visually clear water (see "Suspended Solids and Turbidity" on page 13). Chlorine, iodine, silver and their combinations are available as products suitable for travel.

**Chlorine** is the water treatment agent most widely used worldwide. Its quick effect, good availability, ease of use and wide range of applications are its main advantages. But as many other chemical disinfectants, chlorine does not have any long-term effects. Water treated with chlorine will become contaminated again during prolonged storage.

**Iodine**, like chlorine, is also a halogen, but has a longer shelf life. For historical reasons – iodine was first used by the British and American armies – it is mostly available in Anglo-Saxon countries in the form of tablets. A significant disadvantage of this disinfectant is its unpleasant taste. A high iodine intake during several weeks may lead to serious hyperthyroidism. An activated carbon filter can be used to remove iodine after sanitising.

**Silver**, or rather silver ions, is one of the oldest methods for deactivating bacteria. Silver acts slowly, but its long-term balance is excellent, and it prevents germ growth for up to six months. Silver-based products are ideal for water storage in campers and on boats as well as for civil protection and disaster relief purposes.

**Chlorine Dioxide**, until recently, had to be produced with the aid of a generator in the form of gas. Now it can be made with a single tablet added to water. The main advantages of chlorine dioxide include its effectiveness against all micro-organisms, the short waiting time and its pH independence. Moreover, it is the only disinfectant that is also effective in turbid water. Its only disadvantage is its higher price.

## PRESERVATION

In public water supply networks, the clean drinking water obtained after treatment is distributed through a network to households. Water in this network circulates under high pressure, is cold and protected from light – a hostile environment for germs! This contrasts with the situation inside homes, where the water remains in the piping. It is heated by parallel hot water lines, which promotes germ growth. If this water is then filled into a drinking glass exposed to the daylight, the micro-organisms can reproduce quickly.

Silver was used as far back as during ancient Roman times to preserve water on trips. When silver ions are added to treated water in the form of tablets or drops, it will be protected against recontamination in drinking bottles or water tanks for up to six months.



*Clean water is also important for hygiene. As hygiene increases, diseases decrease, development opportunities improve and prosperity rises.*

## ANTICHLORINE

Many countries add chlorine to their tap water. This is a good solution for old pipelines which might

contaminate the water. Its drawback is the unpleasant taste that travellers are unaccustomed to. Instead of forcing people to plug their noses when brushing their teeth, it is possible to use antichlor. This agent is available in all pharmacies. It converts chlorine by means of thiosulphate into a salt, restoring the neutral taste to water.

## MICROFILTRATION

Bacteria and protozoans are the most common micro-organisms found in drinking water. To remove the most common bacteria from water, a microfilter with a pore size no larger than 0.3 microns is required. Possible filtration media include ceramics, glass fibres and plastics. Protozoans such as Giardia and Cryptosporidium are much larger (1 to 15 microns) and can be retained by microfilters with pore sizes up to 1 micron.

**Microfilters are capable of mechanically retaining bacteria and protozoans, whereas chemical processes destroy the germs but do not remove them from the water.**

In mechanical filtration using a microfilter, the water always passes directly through the filter. The particles are retained by the filter surface. The advantage of **ceramic filters** is that they can be cleaned and re-used several times. The flexibility of glass fibres allows the entire filter structure to be folded, creating an extremely large surface area in a small space. **Glass fibre** filters therefore have a very high contaminant absorption capacity.



*Safety first: Clean drinking water can be produced from any stream or fountain using a water filter bottle.*

## ACTIVATED CARBON (ABSORPTION)

Our environment is becoming increasingly polluted by organic and inorganic substances that enter water, air and soil. Natural water sources always contain safe organic and inorganic substances. Humic acid, for example, is a soil component that produces a brownish water colour when washed out of the soil. Harmful substances such as herbicides and pesticides typically occur in water only in very small quantities. They are only removed when the safety limits are exceeded in order to prevent health problems.



*Water is life and a source of health and well-being. More than 6000 years ago, the first advanced cultures evolved in Mesopotamia, between the Tigris and Euphrates rivers. Their prosperity was based on an elaborate system of dams and waterways designed for irrigation and drainage.*

All of these water pollutants can be removed by filtration using activated carbon. In this process, the substances to be removed come into contact with the activated carbon, whose surfaces absorb them. Activated carbon is available in the form of loose pellets or compressed blocks. Carbon blocks have a much denser structure than carbon pellets and therefore offer a longer contact path for adsorbing chemical contaminants. The surface of the activated carbon will reach its saturation limit more or less quickly as a function of the contaminant loading of the water.

## **WATER SOFTENING**

Raindrops absorb carbon dioxide from the air, which dissolved in water becomes carbonic acid. This slightly acidic rain seeps into the soil and dissolves minerals from the rock such as calcium and magnesium. This is important for the human organism (bones, prevention of heart disease), but is not particularly appreciated when it shows up in homes as scale.

Scale is best reduced through ionic exchange. **BRITA filters** are a common example of this method. The filter cartridge contains small beads that are charged with salt ions. As water passes through the cartridge, the calcium and magnesium ions are exchanged with the salt ions. These filter cartridges are only designed to treat microbiologically safe water and will not eliminate any bacteria. They need to be exchanged regularly to prevent bacteria growth inside. Filter pitchers should be stored in the refrigerator, where the darkness and low temperature inhibit bacteria growth.

## SEA WATER DESALINATION

Surrounded by water, but still nothing to drink! – This is a common problem in sea travel. According to the WHO, water is considered to be of drinking grade if it contains less than 1000 ppm (parts per million) or 1000 milligrams of salt. Sea water has an average salt content of 35,000 ppm.

**It is easy to add salt to water, but much harder to remove it again.**

If enough heat is available, salt water can be evaporated and collected as condensed freshwater. Reverse osmosis is the process of forcing salt water under high pressure through a thin, semi-permeable membrane that does not allow the undesirable minerals to pass through. Some life rafts are already equipped with hand-operated reverse osmosis systems. They are designed to offer their occupants enough water to survive. But due to their low output, they are no option for tourists.



*The desalination of seawater used to require a lot of energy. It was therefore usually only applied on large ships. New methods now make it possible for smaller boats to enjoy the benefits of desalination.*



## GLOBAL VIEW

### **DIFFERENT COUNTRIES, DIFFERENT DANGERS**

THE PATHOGENS TO BE EXPECTED IN DRINKING WATER MAY VARY ACCORDING TO THE SPECIFIC COUNTRIES AND CONTINENTS. THE FOLLOWING MAPS PROVIDE AN OVERVIEW OF THE GLOBAL DISTRIBUTION OF THE VARIOUS RESULTING DISEASES.

### **AGENT AND DISEASE**

- Bacteria of faecal origin (cholera, typhoid fever, dysentery)
- Bacteria of non faecal (pseudomonas, wound infections, legionellosis)
- Protozoans (giardia, amoebic dysentery, cryptosporidiosis)
- Viruses (hepatitis A, polio)

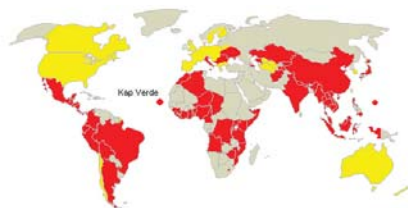
#### Amoebic dysentery

- High risk
- Moderate risk



## Cholera

- Endemic regions
- Isolated imported cases



## Giardia

- High risk



## Hepatitis A

- High risk
- Moderate risk
- Low risk



## Typhoid fever (Salmonella)

- Endemic or hyperendemic form
- Endemoepidemic form
- Sporadic or regionally occurring form





## CONTAMINATED WATER MAKES YOU SICK

### WHAT DOES WATER CONTAIN?

THE MOST COMMON CONSEQUENCE OF CONTAMINATED WATER IS DIARRHOEA. BUT THIS "CLASSICAL" DIARRHOEA ENCOUNTERED DURING JOURNEYS IS NOT INESCAPABLE. SIMPLE PRECAUTIONS ARE POSSIBLE. WHAT IS IMPORTANT IS TO USE CLEAN DRINKING WATER. BUT NOT ALL WATERS ARE EQUAL.

### (NATURAL) MINERAL WATER

The term "natural mineral water" is regulated in Europe by various decrees. It must originate from underground water sources and be of original purity. Bottling must be done at the source itself. Bottled water requires an official acknowledgment. Natural bottled water may be offered in a carbonated or non-carbonated form.

### STILL WATER

The term "still water" refers to the carbonic acid content. Still water contains only little carbonic acid or none at all. A distinction is made between three categories:

**Natural mineral water:** It is bottled from a clearly defined source and must contain a consistent quantity of minerals and trace elements.

**Spring water:** It must originate from a defined source, but does not have to satisfy any criteria other than purity.

**Drinking or table-grade water:** Is produced industrially from mineral, spring, tap or sea water. It must satisfy legal requirements, but its origin does not have to be specified. Table-grade water is purified and mineralised. The goal is to obtain standardised water that can be produced under a given brand name in the same quality in several countries.

## BOTTLED WATER

Bottled water is not a product of nature, but artificially produced. It includes all types of water that companies can bottle and sell at any required location. It may be mineral, spring or tap water that is either carbonated or not. Bottled water must meet certain quality standards depending on the specific country. It is allowed to be stored in cans, barrels or hoses. Today, this water is typically bottled in PET bottles. Bottled water is not guaranteed to be germ-free in every country.

### **Travel tip: Bacteria spread more slowly in carbonated water**



*At the World Water Forum in Kyoto, Japan, in March 2003, the participants were not able to declare water as a "common good" and were not able to declare access to clean drinking water as a human right*

## TAP WATER

Tap water comes from groundwater, surface water and rock springs. It may have been exposed to numerous environmental influences. It is legal to treat this water by various chemicals. Depending on the piping installations it comes into contact with, it may contain traces of lead, copper and other metals. As a basic rule, never drink tap water in tropical and subtropical regions.

### **Travel tip: Even in good hotels in tropical and subtropical countries, one should never drink the tap water.**

## SURFACE WATER

The term surface water refers to standing or flowing bodies of water. It is normally a mixture of groundwater and spring and rain water, although it may also contain waste water. Streams, rivers and lakes may contain minerals in widely varying proportions. Because of the numerous organisms living in and around bodies of water, many organic substances, mostly metabolic, can be found in the water. Frequently, surface water is contaminated by heavy metals and organic compounds introduced from industrial plants and households. A very problematic source of contamination is also agriculture. This applies particularly when farming is not ecologically friendly. In addition to pesticides and herbicides, whose active ingredients often contain halogenated hydrocarbons, large amounts of phosphate and nitrate (fertilizers) and organic substances (manure) may enter water from these sources. All surface water contains various bacteria, viruses and protozoans.



*Bizarre forms of life can be found in water. Water-critters live in lakes, rivers and streams.*

**Travel tip: Always filter and/or sanitise water you take from rivers, streams, lakes, springs, wells and cisterns.**



*The water used for drinking is often the same water used for washing. With the right methods and products, even this water can be turned into safe drinking water.*

## MORE HYGIENE MEANS LESS DISEASE

### **HYGIENE TIPS FOR TRAVELLING**

IN MANY COUNTRIES, HUMAN EXCREMENTS ARE USED AS FERTILISER. CAREFUL, CONSISTENT HYGIENIC PRECAUTIONS IN EATING FOOD AND DRINKING WATER ARE A MUST.

1. Ice cubes must be made from germ-free water; do not use any unless it is clear where they have been produced when you order.
2. Avoid non-bottled beverages that have not been industrially produced.
3. Choose well-cooked foods; avoid raw foods and foods that have only been cooked and fried lightly – seafood, mayonnaise, ice cream, butter cream, etc.
4. Avoid food from street stands.
5. Only eat fruits, raw vegetables and salads that have been cleaned with germ-free water; otherwise, clean them yourself with sanitised water.
6. Never drink fresh, uncooked milk; pasteurised milk is safe.
7. Only drink fruit juices if you are sure the squeezing device and the hands that have been in contact with the fruit are hygienically clean. Beware of bottled fruit juices that contain sugar, as this creates an ideal culture for bacterial growth.
8. Fresh, hot coffee and tea as well as beer and wine are safe. Caution: alcoholic drinks will not destroy bacteria already inside the stomach.
9. To brush your teeth, always use germ-free water; even a gulp of contaminated water may lead to diarrhoea.
10. Take medication only with germ-free water; diarrhoea may affect its effectiveness (e.g. tablets).

11. Do not swim or bathe in the waters (rivers, lakes) of tropical and subtropical countries, where bilharzia is widespread. This disease is caused when pathogens enter through the skin of persons swimming or bathing in freshwater.
12. Wash your hands regularly, especially before handling food and after using the toilet.
13. Always use clean hand towels.



*Fruit that you peel to eat is safe, for example citrus fruit, bananas, pineapples, papayas and mangos.*



## DRINKING WATER IN A TOURIST PARADISE

**TIPS FOR JOURNEYS TO DISTANT DESTINATIONS**

TROPICAL AND SUBTROPICAL TRAVEL DESTINATIONS ARE BECOMING INCREASINGLY POPULAR AND ARE NO LONGER JUST A PRIVILEGE FOR THE RICH AND FAMOUS. TODAY, EVEN FAMILIES TRAVEL TO ASIA, AFRICA OR SOUTH AMERICA.

Instead of the well-known and classical holiday destinations around the Mediterranean, journeys to distant places are becoming increasingly popular. Often, the usual winter skiing holidays are being replaced by trips to warmer regions. Countless travel offers to exotic destinations are available. But unlike trips to developed countries, such journeys require certain health precautions.

Much can be learned **from globetrotters and travel guides** – from typical country customs to the intelligent handling of local drinking water. Since you never know what is in the water, it is best to treat water yourself with your own water filter and sanitising system.



*Children have a much more sensitive water balance than adults. Even a simple case of diarrhoea and vomiting may require a stay in hospital.*

## DRINKING WATER IN EXTREME CONDITIONS

### TIPS FOR EXPEDITIONS

THE WILDERNESS CALLS. AS OUR DAILY LIVES BECOME MORE STRUCTURED, OUR URGE TO ESCAPE INCREASES.

Expeditions require careful preparation. This includes exact route planning, obtaining the necessary travel documents and official permits as well as choosing and buying the right equipment. First-aid kits are especially important. What they contain depends on where you are going to. What definitely cannot be left behind are professional water filters and disinfectants for water treatment.

Even in unspoilt nature, clean water cannot be taken for granted. This is true even if the locals appear to be drinking water from wells or waterholes without suffering any harm. Their bodies have adapted to this water and they have built up the necessary antibodies. Even in the high mountains, water must always be treated before consumption, since wild animals may excrete germs that make humans sick (e.g. beaver fever). Boiling water is a very time-consuming process due to the lower boiling point at high altitudes.

**For larger expeditions with several participants** it is preferable not to prepare drinking water daily, but rather to maintain a supply at base camp. Appropriate preservation methods will allow the drinking water produced to be stored for prolonged periods of time.

*An expedition to the Torres del Peine can test your limits and give you a good recharge for your daily life.*



## DRINKING WATER FROM THE BACKPACK

### TIPS FOR GLOBETROTTERS

#### BACKPACKING HAS BECOME AN ACCEPTABLE, PRACTICAL FORM OF TRAVEL

A loaded backpack should weigh no more than one quarter of your body weight; 10 to 15 kilograms are ideal. With properly tightened shoulder straps, the weight of a backpack will rest comfortably on your hips instead of your shoulders.

**Once the route is set**, trekking shops can provide useful equipment tips. Water treatment products are an absolute must, even in the smallest of packs. Those who leave the beaten path and travel with a smaller budget need to be aware that where there is less comfort, there is usually poorer water quality. Travel preparation therefore always implies making provision for drinking water.

*You might have to get used to the taste of yak tea, but it is usually bacteriologically safe.*



## PRACTICAL AND SAFE

### TIPS FOR RECREATION AND SHORT TRIPS

WHETHER IT'S A WEEKEND GETAWAY OUT OF TOWN OR A SHORT TRIP OUT OF THE COUNTRY, DRINKING WATER IS AN IMPORTANT PART OF TRAVEL PREPARATION.

#### RECREATION

The gurgling mountain stream normally looks very refreshing. But its water quality often leaves much to be desired. Streams and even fountain water near pastures and fertilised meadows may easily be contaminated, even in developed countries.

**Travellers, mountain climbers and bikers** who drink straight from village fountains or from streams along the wayside are risking their health. With each sip, they risk taking in also coliforms or enterococci (faecal streptococci). Even clear streams and lakes may be teeming with pathogens capable of transmitting serious diseases. The ideal alternative to lugging along safe water supplies is a water filter bottle which will produce clean water from any source along the way within no time at all.



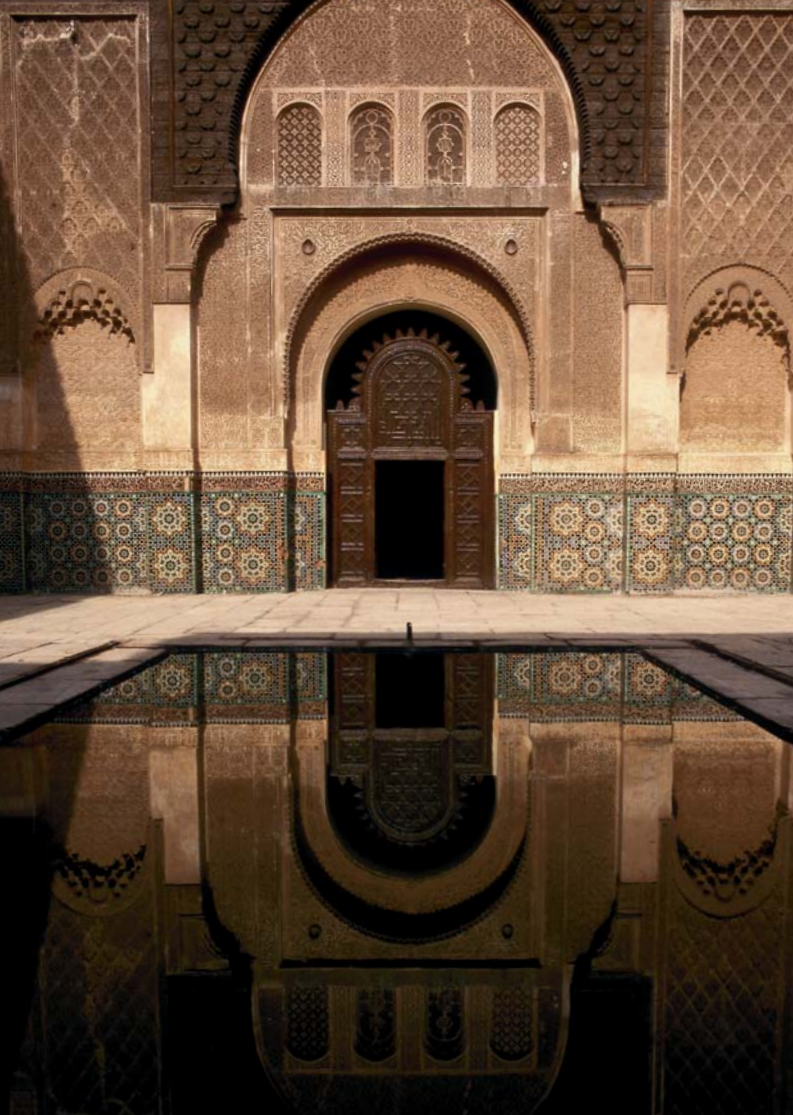
*Treating water along the way is a quick and easy alternative to carrying heavy water bottles.*

## SHORT TRIPS

As travel offers become more varied, holiday journeys become shorter. It is hardly surprising that when people plan short trips – often to exotic destinations – they often forget proper travel preparations. Just as important as sunscreen and swimsuits are water sanitising tablets, for even in the best hotels, tap water is not always really germ-free in all countries.



*Contaminated drinking water can quickly turn a tourist paradise into a bad experience.*



## ELIMINATING PATHOGENS

### **TIPS FOR CULTURAL AND ADVENTURE TRAVEL**

THOSE WHO PREFER TRANQUILITY AND WISH TO EXPERIENCE COUNTRIES AND THEIR CULTURES AND PEOPLE OFTEN TRAVEL OFF THE BEATEN TRACK. THEY DO MUCH RESEARCH TO PREPARE SUCH TRIPS. BUT ULTIMATELY, HEALTH PRECAUTIONS ARE JUST AS IMPORTANT.

Safe drinking water supplies are not always available during discovery expeditions in developing and emerging countries, especially during day excursions. Instead of relying on bottled water, which may not always be germ-free in all regions, you should take along your own bottles filled with previously filtered or disinfected water. This drinking water may, for instance, easily be prepared from the tap water in your hotel.

Another practical solution for light day packs is to carry disinfectants or antichlor with you. An even easier solution is to carry your own drinking water supply system with you in the form of a water filter bottle. It will enable you to make safe drinking water immediately out of any clear water. It does not weigh much more than a standard bicycle bottle.

*Preparing your own drinking water from practically any water source.*



## DRINKING WATER HYGIENE IN EXTREME CONDITIONS

### **WATER IS LIFE**

WHEN DISASTERS STRIKE, DRINKING WATER SUPPLIES ARE SUDDENLY AT RISK. SUCH SITUATIONS CALL FOR SWIFT ACTION, FOR WATER MEANS LIFE – OR EVEN SURVIVAL.

Many causes may limit the availability of public water supplies as a result of contaminated groundwater. Examples include natural disasters such as floods, landslides and tornados as well as human failings such as defects or errors, sabotage or war. In all of these situations, it is important to take precautions with regard to drinking water.

As a consequence of water emergencies, the victims and their rescuers are exposed to an increased risk of contracting infectious diseases such as:

- Diarrhoea caused by different viruses and bacteria,
- Meningitis through viruses,
- Other infectious diseases such as hepatitis A and typhoid fever.

## Drinking water is crucial in emergencies

- As a precaution, always boil water used for drinking and food preparation; this is especially important in preparing food for babies and infants.
- If the drinking water quality is questionable, treat water using microfilters or chemical disinfectants.
- You can use a conventional household bleach as an alternative to specific water treatment methods. To apply the correct dose, check the chlorine concentration declared on the bottle (1 to 10%), and dose as follows.

Chlorine concentration	Drops per litre
1%	10
4 to 6%	2
7 to 10%	1

*If the chlorine concentration is unknown, use ten drops per litre.*

- Do not use water from individual fountains unless it has been treated with a quality microfilter or disinfectants.
- Once regular public water supplies have been restored, carefully clean all taps and let the water run for an extended time before drinking it.



*Russia and South America have the largest freshwater resources, but even in these regions, clean drinking water is becoming increasingly scarce.*



## THINGS WORTH KNOWING ABOUT WATER

### **BLUE PLANET**

- Our drinking water is not allowed to contain either coliforms nor enterococci, and the total germ count is not allowed to exceed 100 per 100 millilitres. Good drinking water is colourless and odourless, clear and free of harmful substances and micro-organisms. But remember: Drinking water is not pure water; it contains minerals and salts.
- The human body requires approximately two litres of liquids per day. We take in a little more than half of this in the form of liquids, and the balance as solid food. In warm regions, the fluid requirement may be as high as six litres per day.
- In many developing countries, farmers use untreated waste water to irrigate their crops. The consequence: Bacteria, amoebas and viruses attack the crops and also often enter the water supply system.

- An increasing demand for meat (for example in India, China, South Korea and Japan) is increasing the need for water. The production of one kilogram of poultry meat requires almost four times more water than the production of one kilogram of grain. Beef requires even ten times more water than grain.
- One in six people on our planet does not have access to clean drinking water. Five million people die every year as a result of inadequate water supplies. That is ten times the number of people who die due to war. Children under the age of five are hit the hardest.
- Two billion women, men and children are affected by the lack of water worldwide – about one third of the world population. It is likely that approximately two thirds of the global population will not have access to clean drinking water by the year 2025.





## SOURCES

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SVGW, Swiss Association of Gas and Water: [www.svgw.ch](http://www.svgw.ch)

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VDM, Verband Deutscher Mineralbrunnen, [www.mineralwasser.com](http://www.mineralwasser.com)

[www.reise-tropenmedizin.de](http://www.reise-tropenmedizin.de)

## LINKS

[www.katadyn.com](http://www.katadyn.com) / [www.katadyn.ch](http://www.katadyn.ch)

[www.premiumvoyage.com](http://www.premiumvoyage.com)

## INFORMATION ABOUT DRINKING WATER

[www.safedrinkingwater.com](http://www.safedrinkingwater.com)

[www.thewaterpage.com](http://www.thewaterpage.com)

## STAY HEALTHY WHILE TRAVELLING

[www.traveldoctor.co.uk](http://www.traveldoctor.co.uk)

[www.cdc.gov/travel](http://www.cdc.gov/travel)

[www.travelmedicine.com](http://www.travelmedicine.com)

## OFFICIAL SITES

[www.epa.gov](http://www.epa.gov) (U.S. Environmental Protection Agency)

[www.bwg.admin.ch](http://www.bwg.admin.ch) (Swiss Federal Office for Water and Geology/  
Switzerland)

## INTERNATIONAL ORGANISATIONS

[www.who.int](http://www.who.int)

[www.unesco.org](http://www.unesco.org)

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